REMARKS

This Amendment is filed in response to the FINAL Office Action mailed April 13, 2009. A Request for Continued Examination and the associated fee is also filed herewith. All objections and rejections are respectfully traversed.

Claims 23-54 are in the case.

No new claims have been added.

Claims 23-33, 35, 37, and 39-54 have been amended.

Interview Summary

Applicant would like to thank Examiner Wassum for conducting the Applicant Initiated Interview on June 25, 2009 and for helping to advance this Application closer to allowance. Generally, the issue discussed involved Applicant's claimed receiving **a write request to modify a range of data bytes of the source storage device** *while the copy operation of the source storage device is in progress*. Applicant and Examiner discussed this issue in terms of Okef's disclosure of receiving a write request to a segment of data, and then *after* the write request has been received, performing out-of-turn copy operations, which Applicant respectfully argued was different from Applicant's claimed receiving a write request to a specific range of data bytes *while the copy operation is in progress*. Examiner noted a desire for clarification and, as such, Applicant has amended the claims.

Finally, Applicant discussed how even if Okef did show receiving a write request to a specific range of data bytes *while the copy operation is in progress*, Okef still *automatically* copies *all* data in a backup segment regardless if a write request has modified the data being copied and regardless if the data to be modified by the write request has already been backed up. As such, Applicant respectfully argued that if Okef copies *all* data *automatically*, Okef does not show Applicant's claimed determining, *in response* **to the write request range falling within the range of data bytes being copied while the copy operation is in progress, if** *a particular range of the range of data bytes* **of the source storage device** *to be modified by the write request range has already been writ-*

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ten to a snapshot AND *in response* **to determining that the particular range of the range of data bytes to be modified by the write request range has** *not* **already been written to the snapshot,** **copying the particular range of the range of data bytes of the source storage device to the snapshot.** Examiner noted that a closer look at Okef would be required.

Claim Objections

At paragraph 5 of the Office Action, claims 31-38, 46, 48, 53, and 54 were objected to because of informalities. Claims 31-38, 46, 48, 53, and 54 have been amended and are believed to be in condition for allowance.

Rejections Under 35 U.S.C. § 112

At paragraph 9 of the Office Action, the Examiner rejected claims 49 and 51 under 35 U.S.C. § 112, paragraph 2 as being indefinite. Claims 49 and 51 have been amended and are believed to be in condition for allowance.

Rejections Under 35 U.S.C. § 102

At paragraph 14 of the Office Action, claims 23, 26, 28-29, 31, 34, 36-37, 39-41, 45-46, 50-52, and 54 were rejected under 35 U.S.C. § 102(b) as being unpatentable in view of Okef et al., U.S. Patent Application Publication No. 2005/0204108 published on September 5, 2005 (hereinafter "Okef").

Applicant's claimed novel invention, as set forth in representative claim 23, comprises in part:

> 23.   A storage system, comprising:
>   a destination storage device configured to store a copy of data from
> a source storage device;
>   a first process configured to initiate a copy operation of the source
> storage device, wherein the copy operation is configured to copy each
> block of the source storage device to the destination storage device,
> wherein the copy operation is performed in segments, and wherein each
> segment is a range of data bytes of the source storage device;

the storage system configured **to receive a write request to mod-
ify a requested range of data bytes of the source storage device** *while
the copy operation of the source storage device is in progress,* wherein
the write request to modify the requested range of data bytes is a write re-
quest range;

the storage system further configured **to determine if the write
request range falls** *within the range of data bytes of the source storage
device* being copied while the copy operation is in progress;

in response **to determining that the write request range falls
within the range of data bytes** of the source storage device being copied
while the copy operation is in progress, **the storage system is** further con-
figured **to determine if** *a particular range of the range of data bytes* of
the source storage device *to be modified by the write request range has
already been written to a snapshot;*

in response to determining that the particular range of the range of
data bytes of the source storage device to be modified by the write request
range has already been written to the snapshot, the write request is config-
ured to be written to the source storage device; and

in response **to determining that the particular range of the
range of data bytes** of the source storage device **to be modified by the
write request range has not already been written to the snapshot, a
second process** is configured **to copy the particular range of the range
of data bytes of the source storage device to the snapshot,** the second
process is further configured to write the write request to the source stor-
age device.

Okef teaches data backup of a physical backup segment. Okef teaches determin-

ing whether there has been an attempt (e.g., hit) to write to a physical backup segment of

a backup segment set in an abstract block set [0247]. If a hit is received for the segment,

that *entire* segment is copied out of turn to an abstract block set, but only *after* the hit is

received [0247.] However, a physical backup segment comprises multiple physical data

blocks corresponding to multiple logical objects [0252]. For example, consider a physi-

cal backup segment that has a first physical data block associated with a logical object

being hit (modified) and three other physical data blocks that are associated with other

logical objects not being modified. A hit to the first physical data block would *automati-

cally* trigger backup of the *entire* physical data segment (i.e., the first physical data block

and the remaining three other physical data blocks), even though the three remaining

physical blocks are not being modified and were already backed up [0252].

Applicant respectfully urges that Okef does not disclose Applicant's claimed novel

storage system to receive a write request to modify a requested range of data bytes of a source storage device *while a copy operation of the source storage device is in progress* and **to determine if the write request range falls** *within the range of data bytes* **being copied while the copy operation is in progress;**

in response **to determining that the write request range falls within the range of data bytes, the storage system to determine if** *a particular range of the range of data bytes* **of the source storage device** *to be modified by the write request range has already been written to a snapshot*; and

in response **to determining that the particular range of the range of data bytes to be modified by the write request range has not already been written to the snapshot, a second process to copy the particular range of the range of data bytes of the source storage device to the snapshot.**

Applicant claims receiving **a write request to modify a particular range of data bytes of the** *source* **storage device** *while a copy operation of the source storage device is in progress*. Applicant further claims determining if *the particular range of the range of data bytes* **of the source storage device** *to be modified by the write request range has already been written to a snapshot*. If *the particular range of the range of data bytes* **of the source storage device** *to be modified by the write request range has already been written to a snapshot*, Applicant claims, *in response*, writing the write request to the source storage device. However, if *the particular range of the range of data bytes* **of the source storage device** *to be modified by the write request range has not already been written to a snapshot*, Applicant claims, *in response*, copying **the particular range of the range of data bytes of the source storage device to the snapshot**.

Applicant respectfully argues that Okef does not show Applicant's claimed receiving **a write request to modify a requested range of data bytes** and then determin-

ing **if the write request range falls within the range of data bytes of the source stor-**
age device being copied *while a copy operation of the source storage device is in pro-*
gress. Specifically, as noted above, Okef begins copying entire backup segments (com-
prising multiple data blocks) *after* a hit (write request) is received by any block of that
segment, in which case that entire segment is then copied out of turn. In other words,
Okef does not begin copying a segment until *after* a hit is received. In contrast, Appli-
cant claims determining **if the write request range** (i.e., *the particular range of the*
range of data bytes of the source storage device *to be modified by the write request*)
falls within the range of data bytes (currently) **being copied** *while the copy operation*
is in progress. Furthermore, Okef shows marking a segment before the segment has been
copied and unmarking the segment after it has been copied, but Okef does not show
marking a segment (or using any other method) to show *the copy operation is* currently
in progress. Thus, because Okef does not begin to copy a segment until, in relevant part,
after a hit has been received, Okef is ostensibly incapable of receiving a segment hit
while a copy operation of the segment *is in progress* and is therefore silent to Applicant's
claimed determining **if the write request range falls within the range of data bytes of**
the source storage device being copied *while a copy operation of the source storage*
device is in progress.

However, even if Okef does show determining if the **write request range** falls
within the range of data bytes being copied *while the copy operation is in progress*, Okef
is still silent to Applicant's claimed determining, *in response* to the write request range
falling within the range of data bytes being copied while the copy operation is in
progress, if *a particular range of the range of data bytes* of the source storage device
to be modified by the write request range has already been written to a snapshot AND
in response to determining that the particular range of the range of data bytes to be
modified by the write request range has *not* already been written to the snapshot,
copying **the particular range of the range of data bytes of the source storage device**
to the snapshot. In particular, Okef's segments comprise multiple (data) blocks, wherein
each block may correspond to different logical objects. More to the point, Okef explicitly

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states that a write (hit) to any of the blocks belonging to a segment would trigger the copying of the entire segment (i.e., all blocks belonging to that segment), even if the other blocks in that segment are not currently being hit or have not been previously hit (i.e., the other blocks are not being updated).

Put another way, a hit to any block in a particular segment will *automatically* result in all blocks in that segment being copied regardless of which block was hit and regardless of whether the data is already backed up. In contrast, Applicant does not claim *automatically* copying any indiscriminate range of data bytes to a snapshot, but instead claims copying **to the snapshot**, for example, only **the particular range of the range of data bytes of the source storage device** *to be modified by the write request range* and doing so intentionally *in response* **to determining** that **the particular range of the range of data bytes of the source storage device** *to be modified by the write request range* has *not already* **been written to the snapshot**. As such, even if Okef does show determining if the **write request range** falls within the range of data bytes being copied *while the copy operation is in progress*, Okef still *automatically* copies every block in a segment (including non-updated blocks outside the hit range and non-updated blocks already copied to backup), and therefore, Okef is silent to Applicant's claimed determining, *in response* **to the write request range falling within the range of data bytes being copied while the copy operation is in progress,** if *a particular range of the range of data bytes* **of the source storage device** *to be modified by the write request range has already been written to a snapshot* AND *in response* **to determining that the particular range of the range of data bytes to be modified by the write request range has** *not* **already been written to the snapshot**, copying **the particular range of the range of data bytes of the source storage device to the snapshot.**

Accordingly, Applicant respectfully urges that the Okef publication is legally precluded from anticipating the claimed invention under 35 U.S.C. § 102 because of the absence from the Okef publication of Applicant's claimed novel

storage system to receive a write request to modify a requested range of data bytes of a source storage device *while a copy operation of the source storage device is*

in progress and **to determine if the write request range falls** *within the range of data bytes* **being copied while the copy operation is in progress;**

      in response **to determining that the write request range falls within the range of data bytes, the storage system to determine if** *a particular range of the range of data bytes* **of the source storage device** *to be modified by the write request range has already been written to a snapshot*; **and**

      in response **to determining that the particular range of the range of data bytes to be modified by the write request range has not already been written to the snapshot, a second process to copy the particular range of the range of data bytes of the source storage device to the snapshot.**

Applicant's Interpretation of the Prior Art

      Applicant's interpretation of Okef was derived, in part, from the following excerpts:

> [0247] *At a step 194, it is determined whether there is a hit on a physical backup segment* that is included in the backup segment set in the abstract block set. *If so, that segment is copied out of turn*--and before the update is made. After the segment has been copied, that segment can be unmarked--further updates may be allowed for that segment. After the segment has been unmarked, the update may be performed. Processing will then continue at step 194 in case there are additional hits (attempts to write to) a physical backup segment included in the abstract block set. (emphasis added)

> [0252] In situations where the physical backup segment granularity is larger than the physical data block size, a write may occur to a physical backup segment that does not correspond to a write to a logical object. For example, consider a physical backup segment that has one physical data block that is in the logical object that is being backed up and three other physical data blocks that belong to other logical objects. *A write to one of the physical data blocks corresponding to different logical object would trigger backup of the physical data segment, even though the logical object being backed up is not being updated.* (emphasis added)

Rejections Under 35 U.S.C. § 103

At paragraph 34 and 37 of the Office Action claims 25, 33, and 47-49 was rejected under 35 U.S.C. §103(a) as being unpatentable over Okef in view of Smith et al., U.S. Patent No. 5,241,631 (hereinafter "Smith").

As noted above, Okef does not disclose or teach Applicant's claimed novel **a storage system to receive a write request to modify a requested range of data bytes of a source storage device** *while a copy operation of the source storage device is in progress* **and to determine if the write request range falls** *within the range of data bytes* **being copied while the copy operation is in progress**; *in response* **to determining that the write request range falls within the range of data bytes being copied while the copy operation is in progress, the storage system to determine if the range of data bytes has been written to a snapshot**; *in response* **to determining that the range of data bytes has been written to the snapshot, the write request is written to the source storage device; and** *in response* **to determining that the range of data bytes has not been written to the snapshot, a second process is to copy the range of data bytes to the snapshot, and then write the write request to the source storage device.** As such, because independent claim 49 contains similar limitations, Applicant respectfully urges that Okef, taken singly or in any combination with Smith, is legally insufficient to render the presently claimed invention obvious under 35 U.S.C. § 103.

At paragraph 35 of the Office Action, claims 24 and 32 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okef as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39- 41, 45-46, 50-52, and 54.

At paragraph 40 of the Office Action, claims 27-35 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okef as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45-46, 50-52, and 54 above, in view of Tawil, U.S. Patent No. 6,421,723.

At paragraph 42 of the Office Action, claims 30 and 38 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okef as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45-46, 50-52, and 54 above, in view of Dulai et al., U.S. Patent No. 6,205,479.

At paragraph 44 of the Office Action, claims 42-44 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okef as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45-46, 50-52, and 54 above, in view of Simpson et al., U.S. Patent No. 6,128,306.

At paragraph 46 of the Office Action, claim 53 was rejected under 35 U.S.C. §103(a) as being unpatentable over Okef as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45-46, 50-52, and 54 above, in view of Osterman et al., U.S. Patent No. 5,867,650.

Applicant respectfully notes that claims 23, 26, 28, 29, 31, 34, 36, 37, 39- 41, 45-46, 50-52, and 54 are dependent claims that depend from independent claims believed to be in condition for allowance. Accordingly, claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45-46, 50-52, and 54 are believed to be in condition for allowance.

Conclusion

All new claims and claim amendments are believed to be fully supported by Applicant's specification.

All independent claims are believed to be in condition for allowance.

All dependent claims are believed to be dependent from allowable independent claims, and therefore in condition for allowance.

Favorable action is respectfully solicited.

Please charge any additional fee occasioned by this paper to our Deposit Account No. 03-1237.

Respectfully submitted,

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